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ESTIMATES OF THE NATIONAL WEALTH OF
DENMARK 1845-2013

Kim Abildgren
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DANMARKS NATIONALBANK **WORKING PAPERS**

ESTIMATES OF THE NATIONAL WEALTH OF DENMARK 1845-2013

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RESUME

Skøn over Danmarks nationalformue 1845-2013

Der er en lang tradition for at opstille skøn over nationalformuen i Danmark. Det seneste estimat er dog fra 1985, og den længste tidsrække dækker kun perioden 1950-1978. I dette papir giver vi en oversigt over tidligere skøn og præsenterer nye årlige tidsrækkeestimer for Danmarks nationalformue 1845-2013 baseret på en bred vifte af såvel nutidige og historiske statistikker som resultater fra tidligere akademiske studier. Afgrænsningen af vores formuebegreb følger stort set de seneste internationale nationalregnskabsstandarder. Som robusthedskontroller sammenligner vi det nye datasæt med nylige tidsrække skøn over den langsigtede udvikling i nationalformuen i andre europæiske lande og tidligere skøn over nationalformuen i Danmark. Vi finder, at forholdet mellem nationalformuen og nettonationalindkomsten i Danmark på langt sigt har fulgt et U-formet mønster, hvilket svarer til udviklingen i andre europæiske lande og indikationer fra tidligere skøn over Danmarks nationalformue. På to områder adskiller den historiske udvikling i Danmark sig fra udviklingen i andre europæiske lande. For det første var der ikke markante fald i forholdet mellem nationalformuen og nettonationalindkomsten i Danmark i forbindelse med de to verdenskrige, sådan som det var tilfældet i Frankrig og Tyskland som følge af krigsrelaterede ødelæggelser af kapitalapparatet. For det andet faldt forholdet mellem nationalformuen og nettonationalindkomsten i Danmark signifikant fra 1870 til 1913, mens forholdet stort set var stationært i Frankrig og Storbritannien i den samme periode. Dette afspejler en hastigere vækst i befolkningen og det reale bruttonationalprodukt per capita i Danmark i denne periode, som var kendetegnet ved den første bølge af industrialisering i Danmark.

ABSTRACT

Estimates of the National Wealth of Denmark 1845-2013

In Denmark, there is a long-standing tradition for estimating the stock of national wealth. However, the most recent estimate is from 1985 and the longest time series available covers only the period 1950-1978. In this paper, we review the earlier estimates and present new annual time series estimates on the stock of national wealth in Denmark 1845-2013 based on a broad range of contemporary and historical statistics as well as results from previous academic research. The coverage of our national wealth is broadly in line with the most recent international national-accounts guidelines. As robustness checks, we compare this new data set with recent time-series estimates on the long-term development in the national wealth in other European countries and earlier estimates of the national wealth in Denmark. We find that the wealth-to-income ratio in Denmark has followed a U-shaped pattern over the long run, which corresponds to developments in other European countries and indications from earlier estimates of the national wealth of Denmark. However, in two areas the historical development in Denmark differ from that of other European countries. First, there were no sharp declines in the Danish wealth-to-income ratio around the two world wars as was the case in France and Germany due to war-related destruction of the capital stock. Secondly, the wealth-to-income ratio in Denmark declined significantly from 1870 to 1913 whereas the ratios were basically stationary in France and UK during the same period. This reflects a faster growth in population and real gross domestic product per capita in Denmark during this period, which saw the first wave of industrialisation in Denmark.

KEY WORDS

National wealth; Economic history.

JEL CLASSIFICATION

E01; N33; N34.

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**Estimates of the National Wealth of Denmark
1845-2013**

by

Kim Abildgren

January 2015

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1. Introduction

Internationally, there has been a renewed academic interest in national wealth compilations during the last decade or so. Most recently, Piketty (2014) published a comprehensive book aimed at a broad audience on the size of the total stock of national wealth in a number of countries seen in a long-term perspective. The book by Piketty, *op.cit.*, draws on a range of research projects in collaboration with other scholars, cf. e.g. Alvaredo *et al.* (2013) and Piketty and Zucman (2014).

In Denmark, there has been a long-standing tradition for estimating the size of the national wealth. However, the most recent estimate on the total stock of national wealth in Denmark is from 1985 and the longest time series available covers only the period 1950-1978. In this paper, we review the earlier estimates and present new annual time-series estimates on the stock of national wealth of Denmark 1845-2013 based on a broad range of contemporary and historical statistics as well as results from previous academic research. As robustness checks, we compare this new data set with long-span time-series estimates on the national wealth in other European countries and earlier estimates of the national wealth in Denmark.

We find that the ratio between the national wealth and the net national income (NNI) in Denmark has followed a U-shaped pattern over the long run. In the period 1845-1875 the wealth-to-income ratio fluctuated around a level of 700 per cent. The ratio declined to around 300 per cent immediately after World War II, but has since increased significantly again. By the end of 2013, the national wealth of Denmark was around 600 per cent of NNI. The U-shaped pattern corresponds to recent research findings from other European countries as well as indications from earlier estimates of the national wealth of Denmark.

In two areas, the historical development in Denmark differ from that of other European countries. First, there were no sharp declines in the wealth-to-income ratio in Denmark around the two world wars as was the case in France and Germany due to war-related destruction of the capital stock. Secondly, the wealth-to-income ratio in Denmark declined significantly from 1870 to 1913 whereas the ratios were basically stationary in France and UK during the same period. This reflects a faster growth in population and real gross domestic product (GDP) per capita in Denmark during this period, which saw the first wave of industrialisation in Denmark.

2. Previous works on the national wealth of Denmark

Falbe-Hansen (1873) presented detailed estimates of the national wealth of Denmark in 1870 along with summary estimates for 1873. He also compared the figures with compilations from other countries. An estimate for 1884 was presented in Falbe-Hansen (1885), and a revised figure for 1884 along with some very rough "gestimates" for 1848 and 1864 were offered in

Falbe-Hansen (1891). In his calculation, Falbe-Hansen included consumer durables such as furniture and clothes (based on information from insurance companies) as well as the capitalised value of taxes on land (measured at an interest rate of 4 per cent per annum). Furthermore, since the monetary system of Denmark at that time followed a metal standard he also included the value of silver and gold coins in circulation, which amounted to around 4 per cent of NNI in 1870. Finally, Falbe-Hansen (1873, 1885, 1891) discussed a range of more conceptual issues in relation to national wealth compilations, including whether the capitalised value of taxes on land should be included in the wealth figures or not.

Warming (1913) presented a summary figure for the national wealth in 1909 and compared it with the figure for 1884 in Falbe-Hansen (1885) and an estimate for 1899/1900 compiled by a Tax Commission. Figures for 1910 and 1916 followed in Warming (1920) and for 1927 in Warming (1930).

The Danish Ministry of Finance compiled figures for the national wealth in 1939 and 1945, cf. Finansministeriet (1945). The figures for 1945 included a claim on Germany reflecting the expenditures in Denmark by the German occupation forces during World War II compulsory financed via accounts at the Danish central bank (Danmarks Nationalbank). However, this amount was never paid by Germany.

Later, Milhøj (1961) presented national wealth figures for 1956, and the weekly Danish financial magazine *Finanstidende* published in 1964, 1971, 1974 and 1979 a range of articles with national wealth calculations. The most recent estimates by *Finanstidende* covered the period 1950-1978 (mid-year figures), cf. Thiberg (ed.) (1979a, 1979b, 1979c, 1979d, 1979e). These are until now the longest consistent time-series estimates on the total national wealth at current market prices available for Denmark.

The Chairmanship of the Danish Economic Council presented an estimate of the national wealth *medio* 1965 in Det Økonomiske Råd (1966). They compared the figure with the earlier estimates (adjusted in order to ensure comparability) published by Finansministeriet (1945), Milhøj (1961) and *Finanstidende* in 1964.

Regarding the value of real property (excluding public infrastructures), Det Økonomiske Råd, *op. cit.*, mainly made use of tax assessments converted into market values via information on prices for properties sold in ordinary free trade. The value of public infrastructures such as railways, harbours, airports *etc.* was based on the compilation of stock data in a benchmark year (1947 based on assessments made in 1939 and 1945), which subsequently were used as the basis for deriving the capital stock for other years via net investment flows (the so-called "perpetual inventory method"). The value of machinery and equipment also followed the perpetual inventory method using stock figures from a benchmark year (1951) based on information on insurance values from the Industrial Production Statistics. The value of transport equipment in the form of motor vehicles

(including motor vehicles owned by households) was based on the number of car registrations *etc.* inflated by depreciated replacement prices. The value other transport equipment (such as railway rolling stock, ships and aircraft), agricultural breeding stocks and the net foreign asset position of Denmark was based on special calculations and separate statistics.

The national wealth calculations by *Finanstidende* in 1971 and later followed the same main principle as those applied by Det Økonomiske Råd, *op. cit.*, although the value of all consumer durables was included in the calculations by *Finanstidende*. The value of consumer durables – excluding motor vehicles owned by households – was based on the perpetual inventory method. Bjerke (1974) offers a detailed discussion on the figures from Det Økonomiske Råd, *op. cit.*, and *Finanstidende*.

Finally, the Inland Revenue Department published an estimate of the national wealth in 1985, cf. Skattedepartementet (1988). The compilations by Skattedepartementet, *op. cit.*, also followed the main principle of Det Økonomiske Råd, *op. cit.*

Kærgård (1991, 1992) reviewed a range of previous estimates mentioned above. Kærgård (1992) also discussed more conceptual issues in relation to national wealth compilations, including calculations in constant prices and whether human capital and the capitalised value of taxes on land and cars should be included in the figures. He estimated the capitalised value of land taxes *etc.* to an amount corresponding to around 54 per cent of NNI in 1985.

Apart from these complete national wealth calculations, a number of other studies has concentrated on several key items of the national wealth.

Abildgren (2008) offered a long-span time series on the Danish net foreign asset position as part of a set of annual financial-account stock data for Denmark 1875-2005. The figures for the stock of net foreign assets in this study were based on statistics published by the Danish central bureau of statistics (Statistics Denmark) and Danmarks Nationalbank combined with historical studies on the issue. Figures for 1844-1875 were presented by Hansen and Svendsen (1968). Official annual stock statistics on net foreign assets are only available from Statistics Denmark since 1920. However, official stock statistics on net foreign assets are available for selected years in the period 1907-1920. For other years, the compilations in Abildgren, *op. cit.*, and Hansen and Svendsen, *op. cit.*, were based on estimates of the surplus on the current account of the balance of payments, net exports of non-monetary gold, information on special transactions not included in the current account and stock figures for selected years compiled by academics.

Kærgård (1991) has in relation to the empirical growth model, CLEO, compiled physical capital stock data for Denmark 1845-1970 based on the perpetual inventory method and stock figures for a benchmark year (1875). Otto (1987) presented physical capital stock for the period 1948-1984, which were compiled in relation to a macroeconomic model for Denmark (ADAM) based on the perpetual inventory method. The aim of the capital stock

data in Kærgård, *op. cit.*, and Otto, *op. cit.*, is to represent measures of production capacity and not the market value of the assets. However, such figures might at least provide a useful starting point in relation to long-span historical national wealth calculations.

Statistics Denmark has compiled annual estimates of the value of the capital stock (including farm land) in current prices for the period 1949-1966 in relation to an analysis of income developments by the Chairmanship of the Danish Economic Council, cf. Det Økonomiske Råd (1968).

Olesen and Pedersen (2006) presented figures for the market value of dwellings (including site values) in current prices for the period 1980-2005 based on detailed data on the living space of dwellings compiled by Statistics Denmark and data on housing prices compiled by the Association of Danish Mortgage Banks.

During the last couple of decades the official statistics in Denmark has been expanded to cover several key elements of the domestic national wealth:

- In 1995, Statistics Denmark began to publish detailed net capital stock figures in current prices as part of the annual National Account Statistics, which covers the period back to end-1965. These net capital stock figures are valued at depreciated replacement cost. As a general rule Statistics Denmark's net capital stock figures for transport equipment and buildings are based on stock data, whereas machinery and equipment and structures are based on the perpetual inventory method, cf. Statistics Denmark (1995, 2014) for details. However, depreciated replacement cost can only be seen as a rough proxy for market values, especially regarding real property.
- In 2001, Statistics Denmark began to publish information on the value of the stock of oil and gas reserves in current prices as part of the Environmental Accounts, which is a system of satellite accounts in relation to the annual National Account Statistics. However, later the statistics on the value of oil and gas reserves was discontinued, so the data is only available the period 1990-2008. The value of the oil and gas reserves compiled by Statistics Denmark was based on the discounted value of the future economic returns from extraction, cf. Statistics Denmark (2010a) for a description of the compilation methods applied.
- In 2004, Statistics Denmark released annual net capital stock figures in current prices for consumer durables covering the period 1965-2003. The figures were valued at depreciated replacement prices based on the perpetual inventory method except for transport equipment owned by households, which was based on stock figures inflated by depreciated replacement prices, cf. Statistics Denmark (2004). However, for the period since 2003, only the figures for transport equipment owned by households have been continued as a system of satellite accounts in relation to the annual National Account Statistics, cf. Statistics Denmark (2013).
- Finally, in 2010, Statistics Denmark began to publish annual figures for the market value of owner-occupied dwellings owned by households (including unincorporated sole proprietorships) in relation to the release of the annual Financial Accounts Statistics, cf. Statistics Denmark (2010b). These figures are only available for the period since end-2008.

The paper at hand adds to the long tradition for national-wealth compilations in Denmark by presenting annual estimates of Denmark's national wealth for the period 1845-2013 based

on a broad range of contemporary and historical statistics as well as results from some of the previous academic studies mentioned above.

3. Conceptual framework, data sources and data construction

This section outlines our definition of national wealth and describes the main sources and methods used to construct the annual data set on the national wealth of Danish residents 1845-2013.

The coverage of our national wealth concept is broadly in line with most the recent international national-accounts guidelines, System of National Accounts 2008 (SNA 2008), cf. European Communities *et al.* (2009). According to §13.4 in SNA 2008, the national wealth is defined as the "sum of non-financial assets and net claims on the rest of the world", Furthermore, §2.34 of SNA 2008 states that the "coverage of assets is limited to those assets which are subject to ownership rights and from which economic benefits may be derived by their owners by holding them or using them in an economic activity as defined in the SNA. Consumer durables, human capital and those natural resources that are not capable of bringing economic benefits to their owners are outside the scope of assets in the SNA". The SNA constitutes a useful framework for organising and analysing national wealth data – even when data sources are somewhat fragmented and sparse, which is often the case in relation to historical statistics on national wealth.

The description of our calculation is divided into three parts covering respectively the periods 1845-1875, 1875-1950 and 1950-2013. The series for the three sub-periods were subsequently chained together (multiplicatively on the basis of year-on-year growth rates) to the overall series. The breakdown of the wealth figures into sub-items in the three sub-periods is shown in Table 1. As recommended in §3.47 in SNA 2008, we included consumer durables as a memorandum item to our wealth data for the period 1950-2013.

Table 1: Breakdown of the total national wealth into sub-items

	1845-1875	1875-1950	1950-2013
Machinery and equipment			x
+ Transport equipment			x
+ Dwellings (excluding farmhouses)			x
+ Non-residential buildings and structures			x
+ Intellectual property products			x
= Total produced assets excluding farmhouses, agricultural breeding stocks and inventories		x	x
+ Agricultural breeding stocks		x	x
+ Inventories			x
= Total produced assets excluding farmhouses	x	x	x
+ Oil and gas reserves	x	x	x
+ Agricultural land and farmhouses	x	x	x
= Total domestic national wealth	x	x	x
+ Net foreign assets	x	x	x
= Total national wealth	x	x	x
Memorandum item:			
Consumer durables (including transport equipment owned by households)			x

All the national wealth figures presented in this paper are in current prices. They are as far as possible stated at market prices end of year and adjusted to reflect the current borders of Denmark (excluding Greenland and the Faroe Islands). An electronic version of the data set is available from the authors on request.

2.1. Compilation approach 1950-2013

The item "machinery and equipment" is for the period 1950-1977 based on the national wealth calculations in current prices by Thiberg (ed.) (1979a). Since 1977, the figures are based on the development in the net capital stock figures for the same item in Statistics Denmark's annual National Account Statistics in current prices.

The item "transport equipment" consists of motor vehicles, railway rolling stock, containers, ships and aircraft in the public and private business sector. The figures are for the period 1950-1977 based on the national wealth calculations for this item (excluding transport equipment owned by households) in current prices presented in Thiberg (ed.) (1979a, 1979c). Since 1977, the figures are based on the development in the net capital stock figures for this item in Statistics Denmark's annual National Account Statistics in current prices.

The market value of dwellings (including site values) in current prices is for the period 1980-2005 based on Olesen and Pedersen (2006) (rental and owner-occupied dwellings, including holiday homes, but excluding farmhouses). For the period since 2005 and the period 1977-1979 the figures are based on the development in the net capital stock figures for dwellings in constant prices from Statistics Denmark's annual National Account Statistics inflated by the development in the cash price index for sale of one-family houses in ordinary free trade from Statistics Denmark. The market value of dwellings in current prices prior to

1977 are based on the figures for rental and owner-occupied dwellings (including site values and holiday homes, but excluding farmhouses) in current prices in the national wealth calculations presented by Thiberg (ed.) (1979b).

Non-residential buildings and structures cover commercial real estate (excluding rental dwellings) such as factory plants and office buildings, government buildings, roads, bridges *etc.* For the period 1950-1977, the figures in current prices are based on Thiberg (ed.) (1979a, 1979b). Since 1977 we base the figures on the development in the sum of the net capital stock figures in current prices for "structures" from Statistics Denmark's annual National Account Statistics and the net capital stock figures in constant prices for "buildings other than dwellings" from Statistics Denmark's annual National Account Statistics inflated by the cash price index for sale of commercial real estate in ordinary free trade from Told&Skat and Statistics Denmark.

The value of intellectual property products is for the period since 1965 based on the net capital stock figures in current prices for this item in Statistics Denmark's annual National Account Statistics. Prior to 1965 the item is assumed to follow the development in the accumulated stock of patents issued by the Danish Directorate of Patent- and Trade Mark Service with Denmark as the home country of the patentee inflated by the implied GDP-deflator. The accumulated stock of patents¹ is based on information from Statistics Denmark whereas the implied GDP-deflator is based on Hansen (1983).

Agricultural breeding stocks are for the period since 1965 based on the net capital stock figures in current prices for this item in Statistics Denmark's annual National Account Statistics. Prior to 1965, the figures are based on the development in current prices in the same item in the national wealth figures compiled by Thiberg (ed.) (1979a).

The value of inventories is for the period since 1977 based on Statistics Denmark's Accounts Statistics for agriculture and non-agricultural industries combined with changes in inventories in current prices from Statistics Denmark's annual National Accounts Statistics. Prior to 1977, the figures are based on the national wealth calculations in current prices in Thiberg (ed.) (1979a).

The item "oil and gas reserves" should according to § 10.179 in SNA 2008 consist of known reserves that are economically exploitable, given current technology and relative prices. In our data this item is for the period 1990-2008 based on information on the value of the stock of oil and gas reserves in current prices in Statistics Denmark's Environmental Accounts. For the period prior to 1990 and since 2008 the figures are based on information from the Danish Energy Agency on the development in the physical reserves of oil and gas

¹ Including German and Japanese patents confiscated by the Danish central government in the years immediately after World War II, cf. Østerborg, (1986).

(converted into oil equivalents) inflated by the oil price. The first reserves of oil and gas in Denmark were discovered in 1966. The data on spot oil prices in USD and exchange rates (DKK versus USD) are based on information from the Danish Energy Agency, British Petroleum's website, St. Louis Fed's Federal Reserve Economic Data (FRED) Database and Danmarks Nationalbank.

The market value of agricultural land (including forestry) and farmhouses is for the period 1950-1977 based on the national wealth figures in current prices compiled by Thiberg (ed.) (1979b). The figures are for the period since 1977 based on the development in the arable agricultural area inflated by the price index for sales of farms. Statistics Denmark is the source for the figures on the arable agricultural area and the price index for sales of farms.

The net foreign assets figures 1950-2013 in current prices are based on Abildgren (2008) and statistical information from Danmarks Nationalbank.

The memorandum item "consumer durables" covers transport equipment owned by households, furniture, major household appliances, radio and television sets, IT equipment, jewellery *etc.* This item is for the period 1950-1977 based on the national wealth calculations in current prices presented by Thiberg (ed.) (1979a, 1979c). For the period 1978-2003 the figures are based on the development in the net capital stock figures in current prices for consumer durables compiled by Statistics Denmark. Since 2003, the figures are assumed to follow the development in the net capital stock figures in current prices for transport equipment owned by households published by Statistics Denmark.

Finally, it should be mentioned that all the figures applied from Statistics Denmark's annual national accounts statistics *etc.* as well as the figures for net foreign asset positions are on an end-of-year basis. The figures in Thiberg (ed.) (1979a, 1979b) are as mentioned stated at mid-year and have been converted to end-of-year basis by simple averaging between mid-year observations.

2.2. Compilation approach 1875-1950

The value of total produced assets excluding farmhouses, agricultural breeding stocks and inventories in current prices is for the period 1875-1950 based on the development in the total physical capital stock (excluding agricultural land and buildings and agricultural breeding stocks and inventories) in current prices in Kærgård (1991).

The value of agricultural breeding stocks and inventories in current prices is for the period 1875-1950 based on the development in the physical capital stock for agricultural breeding stocks and inventories in current prices in Kærgård (1991).

The value of agricultural land and farmhouses is for the period 1875-1950 based on the figure for 1884 in Falbe-Hansen (1885) and the development in the arable agricultural area (adjusted to reflect current borders) inflated by the price index for sales of farms. The sources

for the arable agricultural area are Olsen (1962), Johansen (1985), Bjørn *et al.* (eds.) (1988) and Statistics Denmark, and the figures are partly based on interpolations and the development in annual figures for the area of main cereal and root crops. The sources for the price index for sales of farms are Hansen and Svendsen (1968) and Statistics Denmark.

The figures for net foreign assets figures 1875-1950 in current prices are based on Abildgren (2008). A few notes should be given on a range of special transactions:

- Includes the proceeds received from the sale of the Danish West Indies² to the United States in 1917.
- Includes the amount paid to Germany as compensation for assets in Sønderjylland (the northern part of the old Duchy of Schleswig) in 1920, when Sønderjylland was reunited with Denmark after a referendum in accordance with the Versailles Treaty.
- The expenditures in Denmark during World War II by the German occupation forces – compulsory financed via accounts at Danmarks Nationalbank – were never paid by Germany and are not included in the net foreign asset position of Denmark.

2.3. *Compilation approach 1845-1875*

The value of agricultural land and farmhouses in current prices is for the period prior to 1875 based on the figure for 1870 in Falbe-Hansen (1873) and the development in the arable agricultural area (adjusted to reflect current borders) inflated by the price index for sales of farms. The sources for the arable agricultural area are Olsen (1962), Bjørn *et al.* (eds.) (1988), Christensen (1996) and Statistics Denmark, and the figures are partly based on interpolations. The sources for the price index for sales of farms are Falbe-Hansen and Scharling (1887), Hansen and Svendsen (1968) and Statistics Denmark.

For the period prior to 1875 the figures for the value of total produced assets excluding farmhouses in current prices are based on the development in the total physical capital stock (excluding farmhouses) in current prices in Kærgård (1991). These calculations are based on the assumption that the value of farmhouses in constant prices follows the development in the arable agricultural area (adjusted to reflect current borders).

The figures for net foreign assets figures prior to 1875 in current prices are based on Hansen and Svendsen (1968) and Hansen (1970). A few notes should be given on a range of special transactions:

- Includes the compensation received by Denmark from the US and a range of European states in relation to abolition of the Sound Dues³ in 1857.
- Includes the compensation paid by Germany in 1868 according to the 1864 Treaty of Vienna for Denmark's taking over of Schleswig-Holstein's proportion of the former joint national debt of the Danish monarchy.

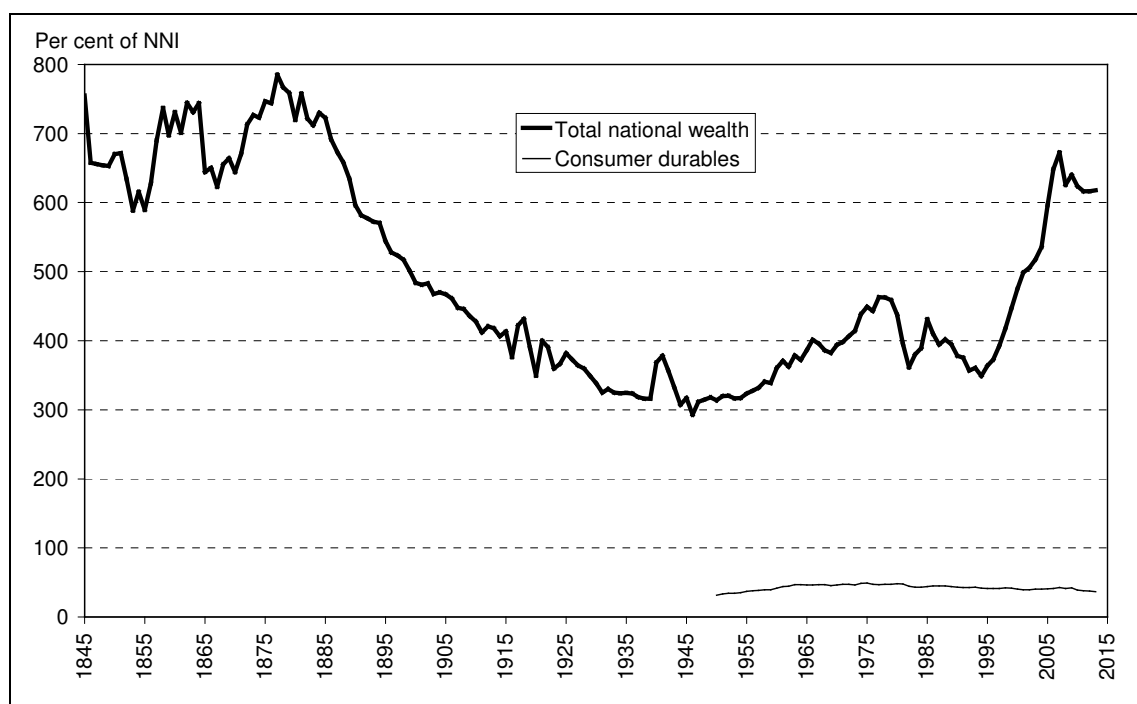
² I.e. today's Virgin Islands. The Danes settled on St. Thomas around 1670, on St. John in 1718, and on St. Croix in 1733, cf. Danish National Archives (2004).

³ The Sound Dues (or Sound Toll), introduced in 1429, was a transit duty on all shipping traffic through the passage between Denmark and Sweden (Øresund), cf. Hvidegaard (2005), Degn (2006) and Gøbel (2010).

3. Trends in Denmark's national wealth since 1845

Chart 1 shows the total stock of national wealth of Denmark relative to NNI since 1845. In the period 1845-1885 the national wealth fluctuated around a level of 700 per cent of NNI. The ratio declined to around 300 per cent of NNI in 1950, but has since increased significantly again. In 2013, the national wealth of Denmark was around 600 per cent of NNI. As mentioned, consumer durables are not included in our national wealth figures. However, for the period since 1950 the value of consumer durables has been relative modest compared to the size of the total national wealth.

Chart 1: Total stock of national wealth and consumer durables in Denmark 1845-2013



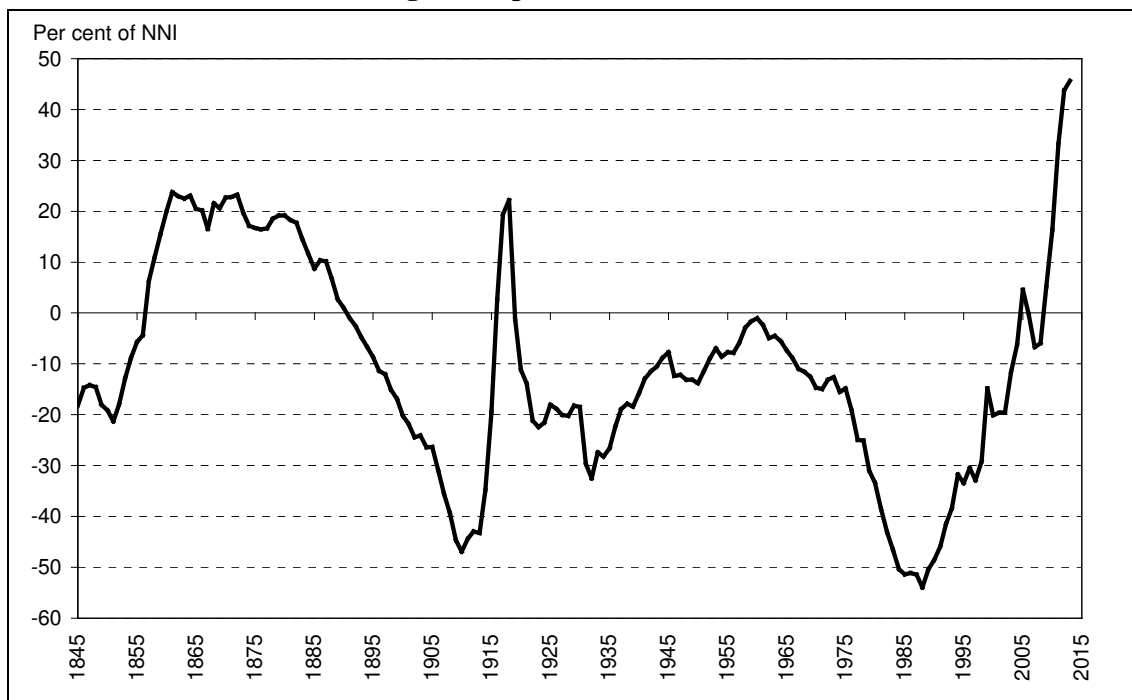
Note: Current prices.

Source: For national wealth figures: See the main text. For NNI: Statistics Denmark and the author's calculations based on Bjerke and Ussing (1958), Hansen (1983), Hansen and Henriksen (1984a, 1984b) and Abildgren (2008).

Denmark's net foreign asset position (international investment position) relative to NNI since 1845 is shown in Chart 2. During most of the period, Denmark has been a debtor nation on a net basis. However, Denmark had large net credit positions vis-à-vis foreign residents during the period 1857-1890 and during World War I, and has again become a net creditor since the late 2000s. The net credit position during the period 1857-1890 partly reflect the compensation received from the abolition of the Sound Dues in 1857 (around 13 per cent of NNI) as well as the compensation (around 7 per cent of NNI) paid by Germany in 1868 for Denmark's taking over Schleswig-Holstein's proportion of the former joint national debt of the Danish monarchy. The net creditor position during World War I reflects the large balance of payment surplus during this period, but also the proceeds received from the sale of the

Danish West Indies (2 per cent of NNI) in 1917. The amount paid to Germany in 1920 as compensation for assets in Sønderjylland was relatively modest (1 per cent of NNI).

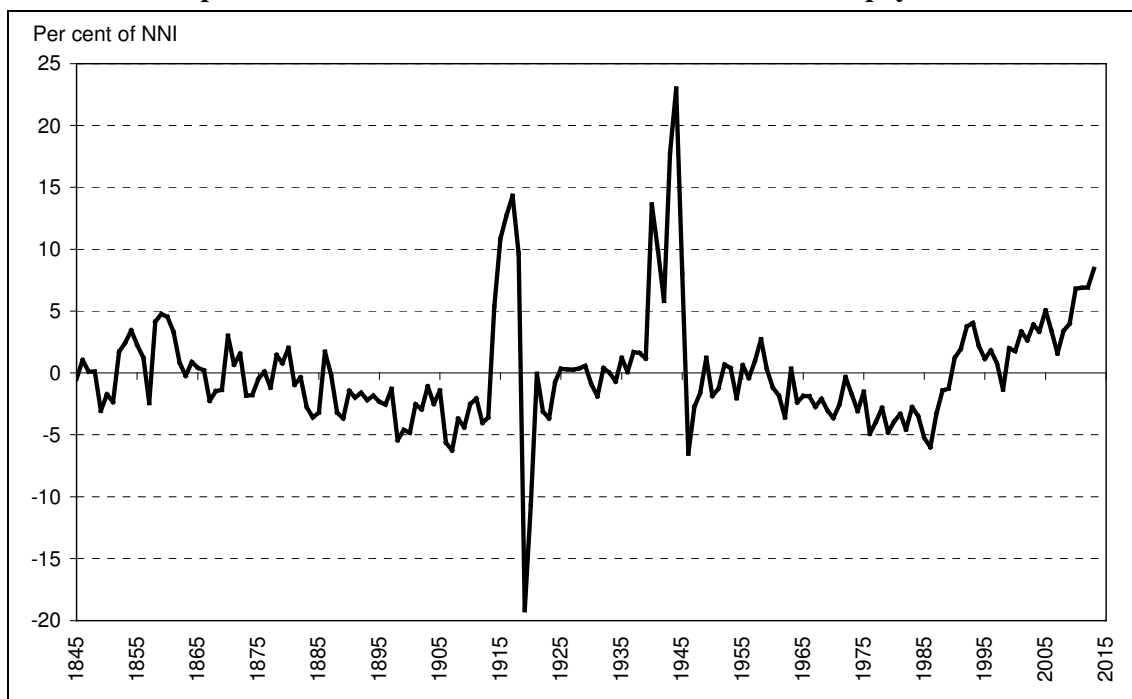
Chart 2: Denmark's net foreign asset position 1845-2013



Note: Current prices. Net foreign assets of Danish residents vis-à-vis non residents.
Source: See Chart 1.

The surplus on Denmark's current account of the balance of payments since 1845 is shown in Chart 3. The large balance of payment surplus during World War II – reflecting the expenditures in Denmark by the German forces during the occupation – did not imply a corresponding increase in Denmark's net foreign asset position. These expenditures (amounting to around 69 per cent of NNI in total) were compulsory financed via German accounts at Danmarks Nationalbank against a guarantee from the Danish central government and were never paid by Germany. In our national wealth figures these claims on Germany are therefore treated as instantaneous debt write-off by the Danish central government.

Chart 3: Surplus on Denmark's current account of the balance of payments 1845-2013



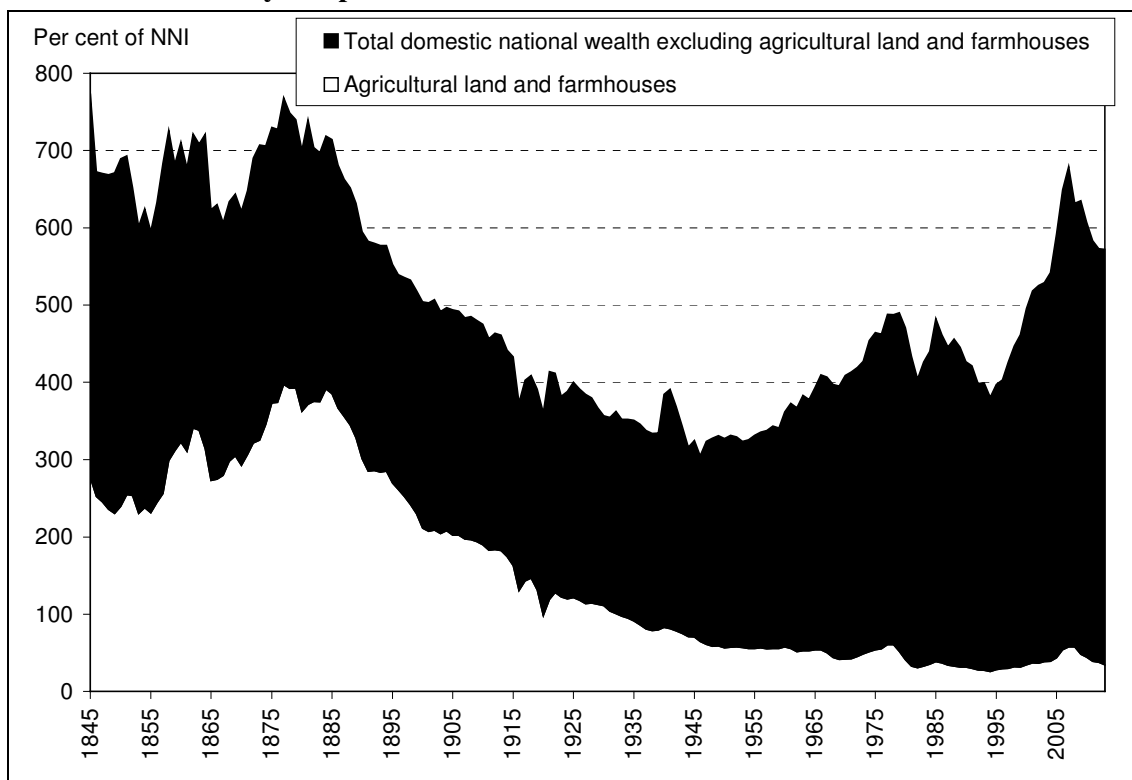
Note: Current prices. The current-account surplus includes the expenditures in Denmark by the German occupation forces during World War II.

Source: For current-account surplus: Statistics Denmark and the author's calculations based on Hansen and Svendsen (1968), Hansen and Henriksen (1984a), Johansen (1985) and Thygesen (1971). For NNI: See Chart 1.

However, the development in Denmark's net foreign asset position can only account for a relative modest proportion of the development in the total national wealth-to-income ratio. This can be illustrated by Chart 4, which shows the domestic national wealth relative to NNI since 1845. Also the domestic national wealth-to-income ratio seems to have followed a U-shaped pattern over the long run.

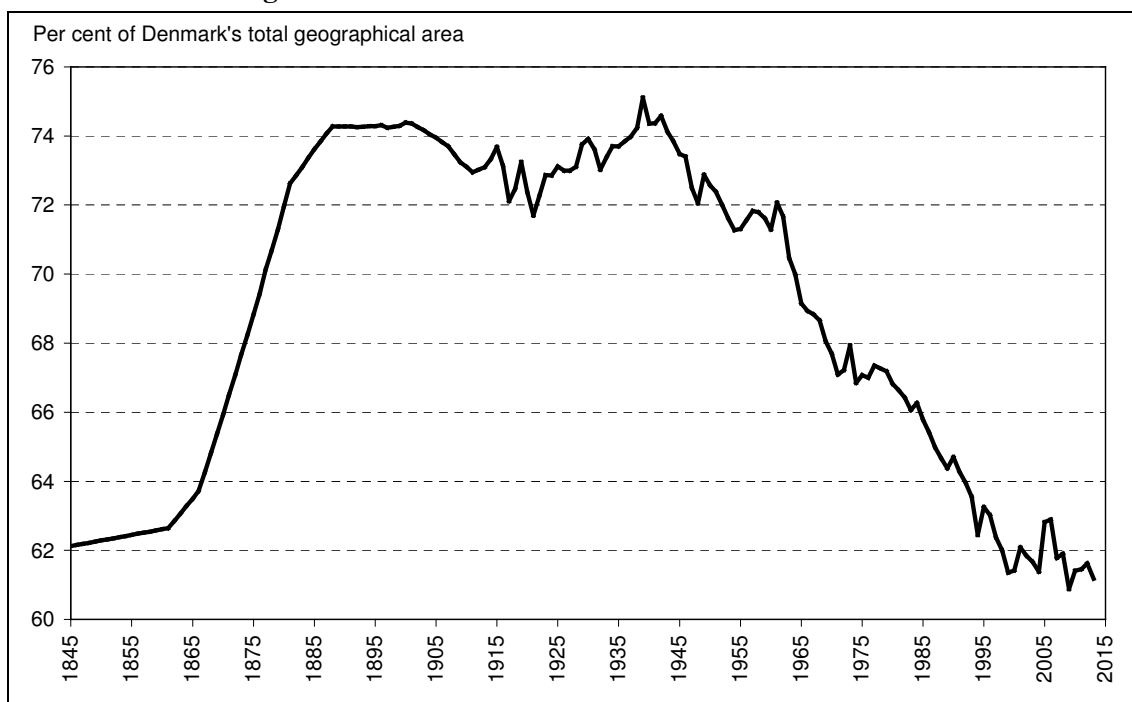
The second half of the 1800s saw a significant expansion of the share of arable land, mainly due to heath cultivation, cf. Chart 5. Since then, the value of agricultural land has declined relative to GDP.

Chart 4: Summary composition of Denmark's domestic national wealth 1845-2013



Note: Current prices.
Source: See Chart 1.

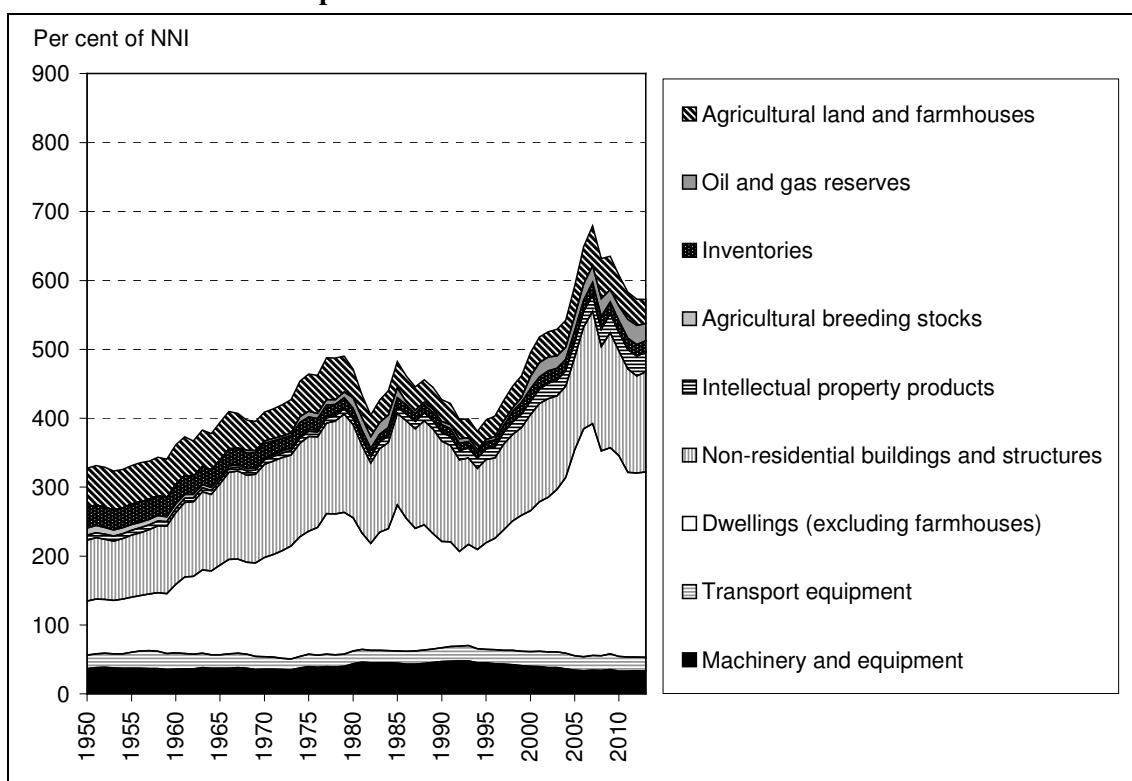
Chart 5: Arable agricultural area in Denmark 1845-2013



Source: See the main text.

Chart 6 shows a detailed decomposition of the domestic national wealth relative to NNI in Denmark since 1950. The development has been dominated by a marked rise in housing wealth. Piketty and Zucman (2014) explain partly the increase in wealth-to-income ratios seen in many countries during the most recent decades with capital gains from rising asset prices. The same seems to have been the case in Denmark, cf. Chart 7, which shows the development in various real property prices in Denmark inflation-adjusted by the Consumer Price Index (CPI). The post-World War II period has seen a strong upward trend in real property prices but also some large price fluctuations compared to the pre-World War II period. Farm prices rose strongly after the Danish membership of the European Communities in 1973, and both farm prices and house prices dropped significantly in the early 1980s following the Second Oil Price Shock. The two most recent periods with financial crises in Denmark (1987-1993 and 2008-2013) have been characterised by a boom-burst pattern in real property prices: A strong increase in real property prices prior to the crisis followed by a subsequent fall.

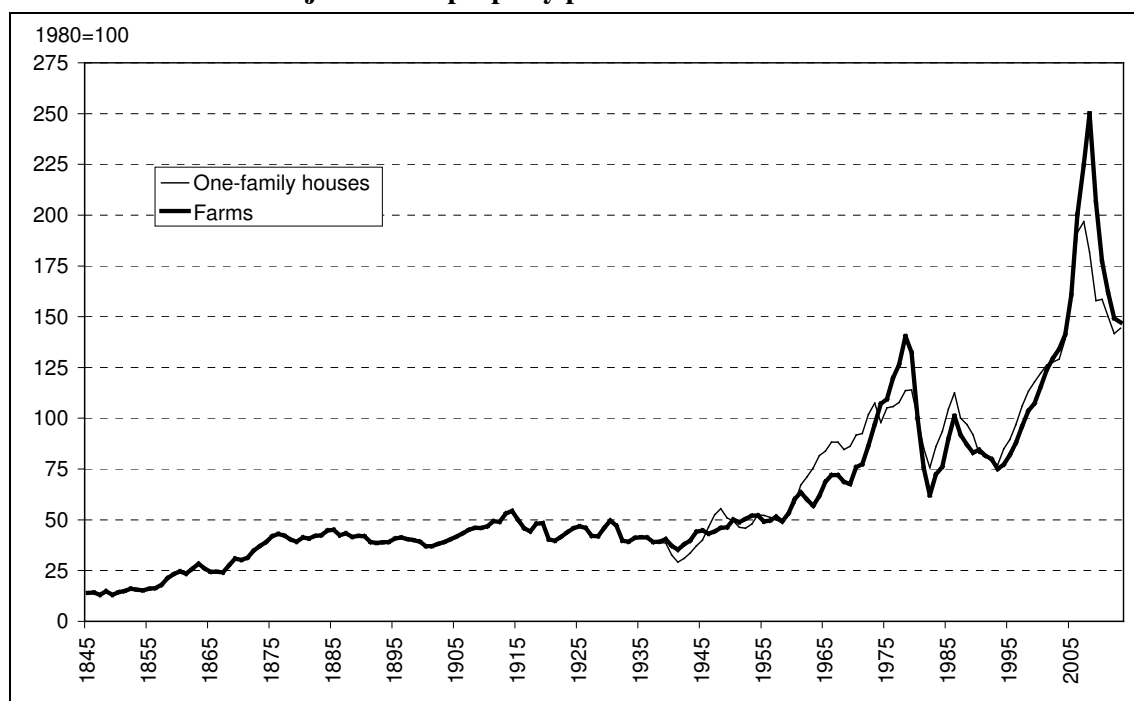
Chart 6: Detailed composition of Denmark's domestic national wealth 1950-2013



Note: Current prices.

Source: See Chart 1.

Chart 7: Inflation-adjusted real property prices in Denmark 1845-2013

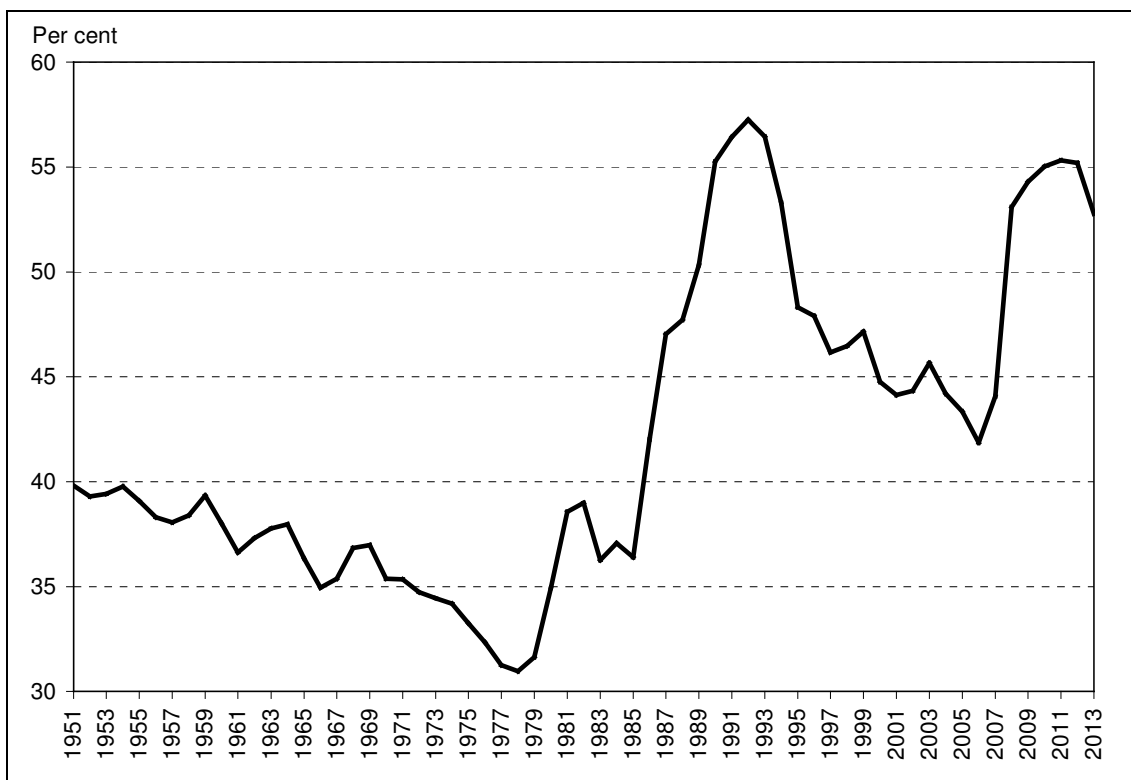


Note: Annual averages. Inflation-adjusted by the Consumer Price Index (CPI).

Source: For real property price figures: Author's calculations based on Økonomiministeriet (1966), Thygesen (1971) and the sources stated in the main text. For CPI: Statistics Denmark and the author's calculations Abildgren (2010).

Real property often serves as collateral pledged by the debtor in connection with a loan. Chart 8 shows the loan-to-value ratio – defined as credit to the domestic non-bank sector from domestic and foreign credit institutions relative to the market value of dwellings, non-residential buildings and structures, agricultural land and farmhouses – since 1951. The total loan-to-value ratio was around 53 per cent by the end of 2013. Although the robustness of the private non-financial sector against adverse macroeconomic shocks seems to have been good at a macro level during the entire World War II period, the credit booms prior to the seven-year slump 1987-1993 and the most recent financial crisis 2008-2013 are clearly visible, and several deposit banks came into financial distress during these economic downturns.

Chart 8: Loan-to-value ratio in Denmark 1951-2013



Note: Current prices. Credit to the domestic non-bank sector from resident deposit banks, resident mortgage banks and non-resident credit institutions relative to the market value of dwellings, non-residential buildings and structures, agricultural land and farmhouses.

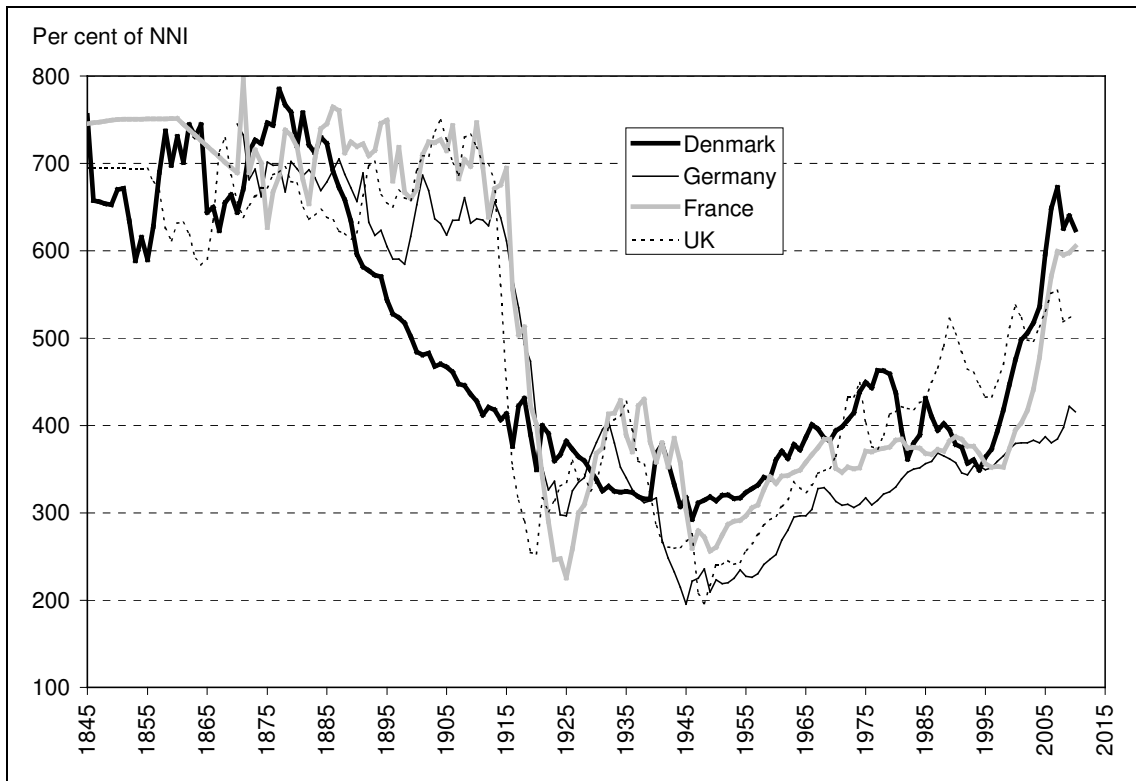
Source: For national wealth figures: See the main text. For credit: Danmarks Nationalbank and the author's calculations based on Abildgren (2009).

4. Long-term developments in a European perspective

Our figures on Denmark's national wealth since 1845 seem to a very high degree to match the recent findings for other European countries in Piketty and Zucman (2013), cf. Chart 9. This study found that the total national wealth in per cent of NNI was around 700-750 in Britain and France in 1845 and in Germany in 1870, and that the ratios followed a U-shaped pattern. For Britain and France the national wealth-to-income ratio increased from around 250 in 1950 to around 500-600 in 2010, whereas the ratio in Germany increased from around 225 in 1950 to 400 in 2010.

In Chart 9 one might notice the sharp declines in the wealth-to-income ratio in Germany, France and UK during the two world wars, which according to Piketty and Zucman, *op. cit.*, partly reflects war-related destructions of the capital stock, especially in France and Germany. The same shocks are not visible for Denmark, which was a neutral country during World War I and subject to German occupation during World War II.

Chart 9: National wealth in European countries 1845-2010



Note: Current prices. France: Prior to 1870 partly based on geometric interpolations. UK: Prior to 1855 partly based on geometric interpolations.

Source: For Denmark: See Chart 1. For other countries: Piketty and Zucman (2013).

One might also notice that the wealth-to-income ratio in Denmark declined by more than 225 per cent of NNI from 1870 to 1913. In contrast the wealth-to-income ratios in France and UK were basically stationary during the same period. As shown in Table 2 this reflects a much faster increase in the nominal NNI in Denmark during this period caused by faster growth in population and real GDP per capita than was the case in France and UK. The last quarter of the 1800s and the first decade of the 1900s are usually considered to the period characterised by the first wave of industrialisation in Denmark, cf. Hansen (1970), Christensen (1989) and Kristensen (1989).

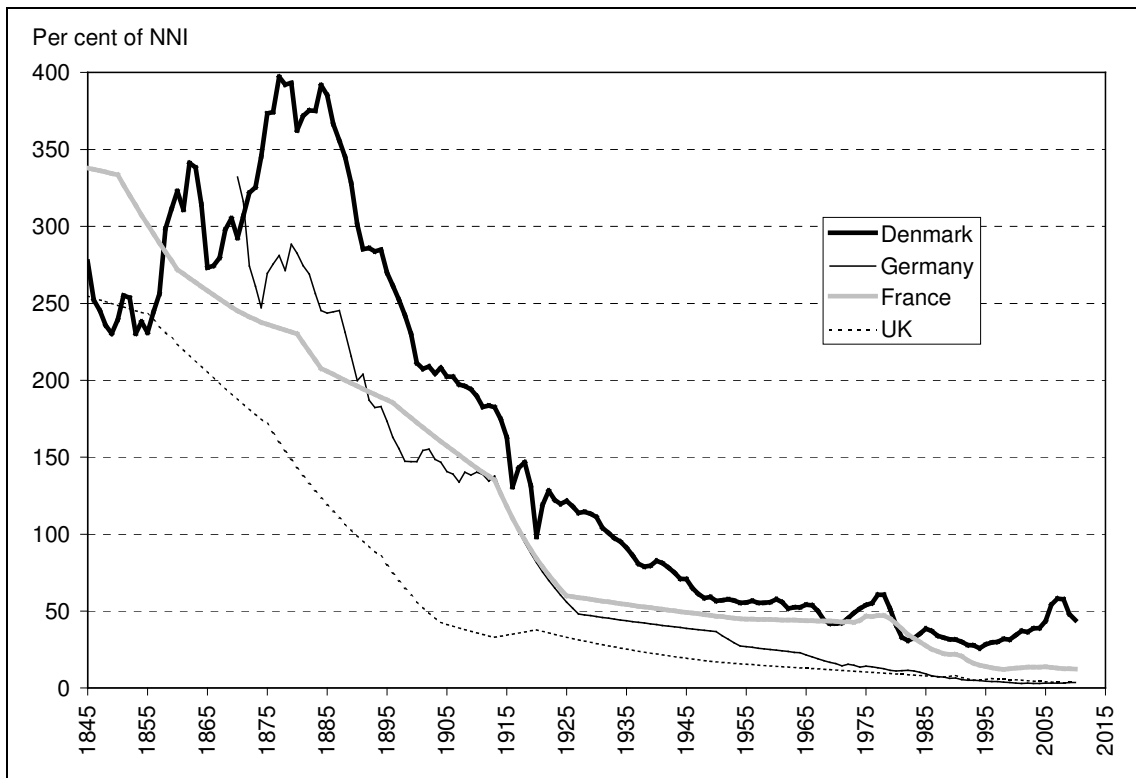
Table 2: Development in income and wealth in European countries 1870-1913

		Denmark	Germany	France	UK
National wealth, per cent of NNI	1870	644	745	689	656
	1913	418	656	671	679
	Change	-226	-89	-18	23
Nominal national wealth, 1870=100	1870	100	100	100	100
	1913	211	356	213	250
Nominal NNI, 1870=100	1870	100	100	100	100
	1913	325	405	218	241
Real GDP per capita, 1870=100	1870	100	100	100	100
	1913	195	200	186	154
Population, 1870=100	1870	100	100	100	100
	1913	158	166	108	145
Consumer price index, 1870=100	1870	100	100	100	100
	1913	90	131	106	93

Source: For national wealth and NNI: See Chart 9. For real GDP per capita, population and CPI: Maddison (1991, 2001).

Our findings regarding the value of agricultural land seem to match the results in Piketty and Zucman (2013). In France and UK the value of agricultural land declined from around 250-350 per cent of GDP in 1845 to 50 per cent or less in 1950, cf. Chart 10.

Chart 10: Value of agricultural land in European countries 1845-2010



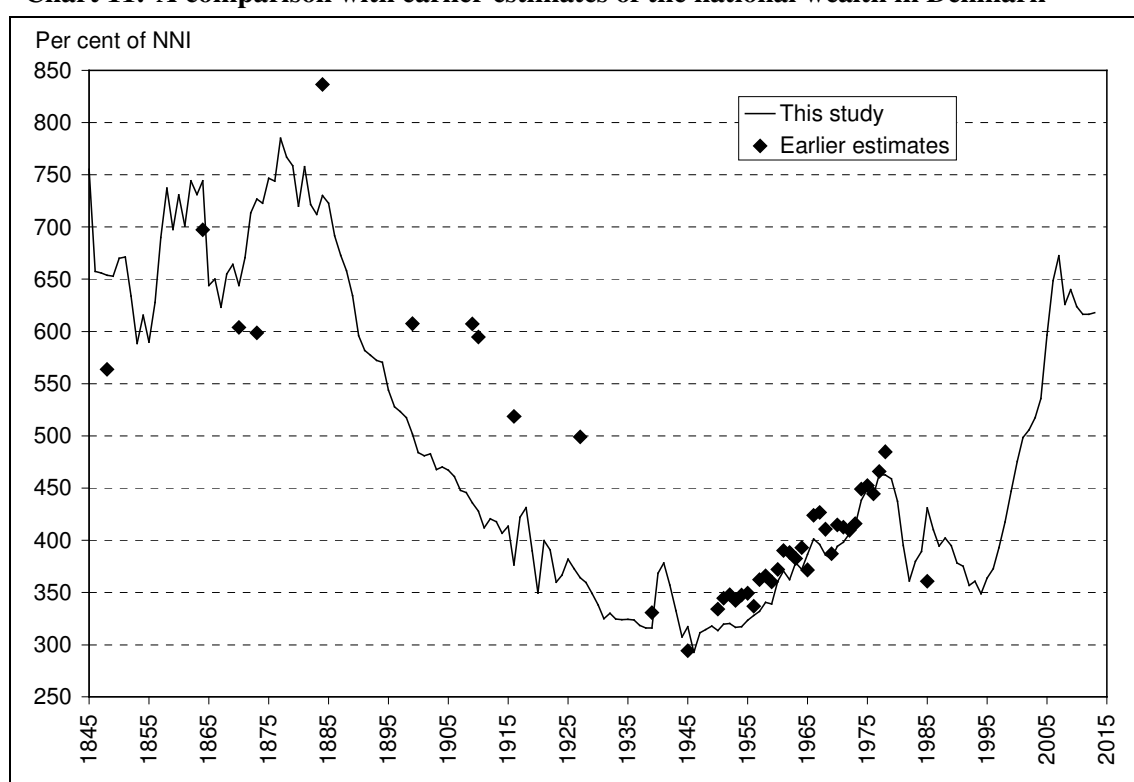
Note: Current prices. Denmark: Including the value of farm houses. Germany, France and UK: Prior to 1970 partly based on geometric interpolations.

Source: For Denmark: See Chart 1. For other countries: Piketty and Zucman (2013).

5. Comparison with earlier estimates on the national wealth of Denmark

In Chart 11, we compare the estimates of the stock of Denmark's national wealth compiled in the paper at hand with a range of the earlier estimates referred to in section 2. The Chart serves as a reminder of the uncertainties related to such calculations due to differences in data sources, compilation methods and the choice of items included in the wealth figures. However, in both the new as well as the earlier estimates the wealth-to-income ratio in Denmark seems to have followed a clear U-shaped pattern over the long run.

Chart 11: A comparison with earlier estimates of the national wealth in Denmark



Notes: Current prices. The alternative estimates are from Falbe-Hansen (1873, 1885, 1891), Warming (1913, 1920, 1930), Det Økonomiske Råd (1966), Thiberg (ed.) (1979a) and Skattedepartementet (1988). Averages in those case where different authors have estimates for the same year.

Source: See Chart 1 and the notes above.

6. Final remarks and scope for future research

Abildgren (2008) presented a first attempt to construct a set of annual financial-account stock data for Denmark since 1875. This paper has presented a first effort to construct annual time series estimates on the total stock of national wealth in Denmark since 1845.

As mentioned there is naturally an issue regarding uncertainties related such long-span national wealth figures, and due to lack of sufficient information some of our figures are based on rather crude assumptions that are open for discussion. Furthermore, we have only

been able to compile the figures prior to 1950 at a rather aggregated level. The arrival of new historical-statistical studies might in future allow for revisions and improvements of the historical time series presented in the paper at hand. It could also be an interesting future research project to disaggregate the total national wealth series by institutional sectors (e.g. general government, financial sector, non-financial business sector and households).

We have not explored the long-span developments in the personal wealth distribution in Denmark since this issue is covered by two recent papers based on historical statistics on taxable wealth combined with household microdata for the most recent decades, cf. Atkinson and Søggaard (2013) and Roine and Waldenström (2014). The results from these studies indicate that the top percentile of the net wealth distribution declined significantly from around 1910 to 1980 followed by a modest increase.

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